Dina Mistry

Network Scientist · Infectious Disease Modeler · Data Science Researcher

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Summary

Computational researcher with an interdisciplinary background in physics, network science, and epidemiology. 6+ years experience modeling real world complex systems, contagion phenomena, and data driven models of diverse human contact networks. My interests lie in understanding the foundations of complex systems and developing tools and methods for data driven research in health, misinformation, and social good.

Education

Northeastern University *Boston, MA*

Ph.D. in Physics *01/01/2014 - 01/01/2019*

Dissertation: The Heterogeneous Nature of Contagion Processes in Complex Networks

Advisor: Dr. Alessandro Vespignani, Network Science Institute Director and Sternberg Family Distinguished Professor

Northeastern University *Boston, MA*

M.Sc. in Physics *09/01/2012 - 01/01/2014*

University of Toronto *Toronto, Canada*

Hon. B.Sc. in Physics & Astronomy, Minor in Mathematics with High Distinction *09/10/2007 - 06/12/2012*

Undergraduate Thesis: The Axisymmetric Geometry of Saturn's Magnetic Fields

Advisor: Dr. Sabine Stanley, Bloomberg Distinguished Professor

Skills & Expertise

Programming Python (NumPy, Pandas, scikit-learn, NLTK, Cartopy, PySpark), C++, R, SQL

Visualization Matplotlib, d3, Gephi

Software LaTeX, Git, Linux, MacOS, Microsoft Office, Notion

Experience

Institute for Disease Modeling, The Bill & Melinda Gates Foundation *500 5th Avenue Seattle, WA*

Postdoctoral Research Scientist

Network Epidemiology and Behavior *07/13/2020 - PRESENT*

- Modeling strategies and tradeoffs for reopening schools in King County, Washington during the COVID-19 pandemic
- Developing agent based models of herd immunity and changes in behavior
- Presenting ongoing COVID-19 forecasting and analysis to local and state public health officials to inform ongoing control strategies
- Leading modeling of health information campaign strategies to promote mask usage and social distancing in Dakar, Senegal during COVID-19
- Developing an open-source Python package to model testing, contact tracing, and other interventions for infectious disease transmission in contact networks
- Lead developer and maintainer of an open-source Python package to generate data-driven human contact networks around the globe for research on public health
- Modeling the role of social trust in acceptance of health (mis)information during COVID-19
- Collaborating with software development and test engineers on open source tools for public health research

Institute for Disease Modeling, Intellectual Ventures *3150 139th Avenue SE Bellevue, WA*

Postdoctoral Research Scientist

Network Epidemiology and Behavior *02/04/2019 - 07/13/2020*

- Modeling the control and mitigation of COVID-19 pandemic in human contact networks in the US and global populations
- Presented COVID-19 forecasting and analysis to local and state public health officials to inform ongoing control strategies
- Developing an open-source Python package to model testing, contact tracing, and other interventions for infectious disease transmission in contact networks
- Lead developer and maintainer of an open-source Python package to generate data-driven human contact networks around the globe for research on public health
- Modeling contagion-like adoption of awareness and health behaviors in social networks
- Modeling the role of social trust and the long standing effects of memory of disease risk in acceptance of health (mis)information
- Collaborating with software development and test engineers on open source tools for public health research

Northeastern University *177 Huntington Avenue, Boston, MA, 02115*

Graduate Researcher, MOBS Lab, Network Science Institute

Synthetic Contact Networks *10/15/2015 - 01/23/2019*

- Developed adaptive algorithms to generate synthetic human contact networks using multiple data sources for diverse populations
- Modeling infectious disease spreading in data-driven synthetic contact networks
- Implemented Markov chain Monte Carlo (MCMC) methods and computational methods to infer epidemiological parameters and validate with serological data
- Built and maintained a database of age mixing contact matrices for 300+ global locations
- Supervised junior graduate students
- Invited speaker at the 2017 Conference on Complex Systems (CCS 2017)

H1N1 Pandemic Scenario Analysis *01/04/2015 - 01/23/2019*

- Characterized global epidemic spreading patterns across different scenarios
- Analyzed the predictability of and visualized stochastic micro-simulations of multiple pandemic scenarios
- Analyzed micro-simulations and commercial airline mobility network data using statistical mechanics, network science, information theoretic measures, and unsupervised machine learning algorithms

Spreading of Zika virus in the Americas (www.zika-model.org) *01/03/2016 - 05/28/2017*

- Developed a stochastic data-driven vector-borne model of the 2016 Zika outbreak in real-time; collaborating with international research groups
- Aided in streamlined analysis pipeline of simulation forecasts for time sensitive reports delivered to public health agencies (CDC, WHO)
- Collected, processed, and analyzed daily epidemiological case report data from 40 Pan-American countries for model calibration

Cover Music Network *09/04/2014 - 12/22/2014*

- Scraped a database of musicians and cover songs (whosampled.com) to create a temporal network of connected artists
- Structured, cleaned, analyzed, and visualized a network with 70,000+ cover songs and 28,000+ artists spanning over 400 years
- Presented findings at final examination for PHYS 5116: Complex Networks (link to slides 🔗)

Committed activists and the reshaping of status-quo social consensus *05/01/2013 - 10/22/2015*

- Developed agent based models of negotiation on conventions and opinion adoption in temporal social networks
- Explored campaign strategies to reduce the time and critical mass needed to drive populations towards consensus, as well as the hindering effects of community structures (echo chambers)
- Presented findings at the 2017 International School and Conference on Network Science

Software

Open Source Software

Core Developer

SynthPops: Python, PyPI | http://synthpops.org/ *03/09/2020 - Present*

Contributor

Covasim: Python, PyPI | https://covasim.org *03/15/2020 - Present*

Presentations

Invited Talks

Network Science for Social Good (NetSci 2019) *Burlington, VT*
Diversify NetSci *05/27/2019*

Data Science and Methods 573, University of Washington *Seattle, WA*
Guest Lecturer on Network Science *02/28/2019*

Institute for Disease Modeling *Bellevue, WA*
The effects of complex networks on infectious disease spreading *09/27/2018*

Humanyze *Palo Alto, CA*
Exploring the effects of complex networks on contagion phenomena *09/03/2018*

Conference on Complex Systems *Cancun, Mexico*
The influence of cultural and societal diversity on epidemic spreading *09/19/2017*

Contributed Talks

Institute for Disease Modeling Symposium (IDM Symposium 2020) *(Virtual, Postponed) Seattle, WA*

The longstanding effects of disease awareness, memory, and social trust on infectious disease spreading in social networks *05/29/2019*

International School and Conference on Network Science (NetSci 2020) *(Virtual) Rome, Italy*
Diversity, Equity, & Inclusion in Network Science and Society *09/19/2020*

International School and Conference on Network Science (NetSci 2019) *Burlington, VT*
Inferring high-resolution disease specific human mixing patterns *05/29/2019*

3MinuteThesis, GWISE, Snell Library, Northeastern University *Boston, MA*
Data-driven approaches to infectious disease modeling and the role of human interaction networks *10/16/2018*

International Conference on Complex Networks *Boston, MA*
A data-driven approach to infer social contact networks in the context of infectious disease modeling *03/05/2018*

Grad Research Panel, Snell Library, Northeastern University *Boston, MA*
Data-driven approaches to stochastic infectious disease modeling *02/28/2018*

International School and Conference on Network Science (NetSci 2017) *Indianapolis, IN*
Committed activists and the reshaping of status-quo social consensus *06/22/2017*

Poster Presentations

Epidemics *Charleston, SC*
The longstanding effects of disease awareness and social memory on infectious transmission in networks *12/04/2019*

Research, Innovation, and Scholarship Expo, Northeastern University *Boston, MA*
Using data-driven models to infer social contact patterns in the context of epidemics *04/07/2016*

Publications

* Indicates equal contribution

Exemplars in Africa: Evaluating the impact of the 100 Mille Etudiants program to increase adoption of protective behaviors against COVID-19 in Dakar, Senegal
D. Mistry*, L. A. Skrip*, N. Noori*, M. Sall, I. Ba, A. Oron, and B. M. Althouse. *Manuscript in preparation.*

SynthPops: A Generative Model of Synthetic Contact Networks.
D. Mistry, C. C. Kerr, D. J. Klein, and B. M. Althouse. *Manuscript in preparation.*

Maximizing education while minimizing COVID-19 risk: priorities and pitfalls for reopening schools
J. Cohen, **D. Mistry**, C. C. Kerr, D. J. Klein. *Manuscript in preparation.*

The longstanding effects of disease awareness, trust, and memory on infectious disease transmission in social contact networks.
D. Mistry, L. Hébert-Dufresne, and B. M. Althouse. *Manuscript in preparation.*

Controlling SARS-CoV-2 via test-trace-quarantine.
C. C. Kerr, **D. Mistry***, R. M. Stuart*, K. Rosenfeld, G. R. Hart, P. Selvaraj, R. C. Núñez, J. A. Cohen, R. G. Abeysuriya, L. George, B. Hagedorn, M. Jastrzebski, M. Fagalde, J. Duchin, M. Famulare, and D. J. Klein. *Manuscript under review .*
https://www.medrxiv.org/content/10.1101/2020.07.15.20154765v3

Modelling the impact of reducing control measures on the COVID-19 pandemic in a low transmission setting.
N. Scott, A. Palmer, D. Delport, R. G. Abeysuriya, R. M. Stuart, C. C. Kerr, **D. Mistry**, D. J. Klein, R. Sacks-Davis, K. Heath, S. Hainsworth, A. Pedrana, M. Stoove, D. P. Wilson, M. Hellard. *Manuscript under review.*
https://www.medrxiv.org/content/10.1101/2020.06.11.20127027v1

Determining the optimal strategy for reopening schools, work and society in the UK: balancing earlier opening and the impact of test and trace strategies with the risk of occurrence of a secondary COVID-19 pandemic wave.
J. Panovska-Griffiths, C. C. Kerr, R. M. Stuart, **D. Mistry**, D. J. Klein, R. M. Viner, C. Bonell. Lancet Child Adolesc Health. 2020.
https://doi.org/10.1016/S2352-4642(20)30250-9

Covasim: an agent-based model of COVID-19 dynamics and interventions.
C. C. Kerr, R. M. Stuart, **D. Mistry**, R. G. Abeysuriya, G. R. Hart, K. Rosenfeld, P. Selvaraj, R. C. Núñez, B. Hagedorn, L. George, A. Izzo, A. Palmer, D. Delport, C. Bennette, B. Wagner, S. Chang, J. A Cohen, J. Panovska-Griffiths, M. Jastrzebski, A. P. Oron, E. Wenger, M. Famulare, D. J. Klein. https://www.medrxiv.org/content/10.1101/2020.05.10.20097469v1

Seeding COVID-19 across sub-Saharan Africa: an analysis of reported importation events across 40 countries.
L. A. Skrip, P. Selvaraj, B. Hagedorn, A. L. Ouédraogo, N. Noori, **D. Mistry**, J. Bedson, L. Hébert-Dufresne, S. V. Scarpino, B. M. Althouse. *Manuscript under review .* https://www.medrxiv.org/content/10.1101/2020.04.01.20050203v2

Spread of infectious disease and social awareness as parasitic contagions on clustered networks.
L. Hébert-Dufresne, **D. Mistry**, B. M. Althouse. *Manuscript under review .* https://arxiv.org/pdf/2003.10604.pdf

Inferring high-resolution human mixing patterns for disease modeling.
D. Mistry, M. Litvinova, A. Pastore y Piontti, M. Chinazzi, L. Fumanelli, M. F. C. Gomes, S. A. Haque, Q. Liu, K. Mu, X. Xiong, M. E. Halloran, I. M. Longini, S. Merler, M. Ajelli, A. Vespignani. *Manuscript under review .* https://arxiv.org/abs/2003.01214

Characterizing the global spread of epidemics and their predictability through human mobility networks.
D. Mistry, K. Sun, A. Pastore y Piontti, M. F. C. Gomes, L. Rossi, A. Vespignani. *Manuscript in preparation.*

Quantifying the risk of Zika virus local transmission in the continental US during the 2015-2016 ZIKV epidemic.
K. Sun, Q. Zhang, A. Pastore-Piontti, M. Chinazzi, **D. Mistry**, N. E. Dean, D. P. Rojas, S. Merler, P. Poletti, L. Rossi, M. E. Halloran, I. M. Longini, A. Vespignani. BioMed Central Medicine. 16. 1. 195. 2018. https://doi.org/10.1186/s12916-018-1185-5

Spreading of Zika virus in the Americas.
Q. Zhang, K.Sun, M. Chinazzi, A. Pastore-Piontti, N. E. Dean, D. P. Rojas, S. Merler, **D. Mistry**, P. Poletti, L. Rossi, M. Bray, M. E. Halloran, I. M. Longini, A. Vespignani. Proceedings of the National Academy of Sciences. 114. 22. E4334-E4343. 2017.
https://doi.org/10.1073/pnas.1620161114

Committed activists and the reshaping of status-quo social consensus.
D. Mistry, Q. Zhang, N. Perra, A. Baronchelli. Phys. Rev. E. 92. 042805. 2015. https:/doi.org/10.1103/PhysRevE.92.042805

Reports & Other Writing

Schools are not islands: we must mitigate community transmission to reopen schools.
J. Cohen, **D. Mistry**, C. C. Kerr, Michael Famulare, and D. J. Klein. Report on Infohub

Modeling countermeasures for a balanced reopening in King County, Washington.
K. Rosenfeld, C. C. Kerr, J. Cohen, R. Núñez, G. Hart, **D. Mistry**, P. Selvaraj, and D. J. Klein. Report on InfoHub

COVID-19 intervention effectiveness and epidemic trends for Oregon: a model-based analysis.
C. C. Kerr, B. Hagedorn,**D. Mistry**, and D. J. Klein. Report on Infohub

Professional Service & Leadership

Conferences, Institutes, and Workshops

2020	**Parallel Session Organizer: Vaccine Hesitancy & Misinformation**, IDM Symposium 2020	*(Virtual, Postponed) Seattle, WA*
2020	**Co-Organizer & Reviewer**, NetSci 2020 Financial Support Committee	*(Virtual) Rome, Italy*
2020	**Co-Organizer**, 2nd Annual Diversify Netsci, NetSci 2020	*(Virtual) Rome, Italy*
2020	**Co-Organizer**, The Confusions of a Young Scientist, NetSci 2020	*(Virtual) Rome, Italy*
2020	**Program Committee**, NetSci 2020	*(Virtual) Rome, Italy*
2020	**Program Committee**, NetSci-X 2020 Winter Conference	*Tokyo, Japan*
2019	**Co-Organizer**, Inaugural Diversify NetSci, NetSci 2019	*Burlington, VT*
2018	**Program Committee**, International Conference on Complex Networks	*Boston, MA*
2018	**Art of Networks local organizer**, International Conference on Complex Networks	*Boston, MA*
2018	**Paper Unwind Co-Organizer: Society of Young Network Scientists (SYNS)**, International Conference on Complex Networks	*Boston, MA*

Professional Societies

2019-2020	**Chair**, Society for Young Network Scientists (SYNS)	*International*
2018	**Women's Summer Retreat Organizer**, GWISE (Graduate Women in Science and Engineering)	*Cambridge, MA*

Peer Review

2020	**Manuscript Reviewer**, Nature Communications
2020	**Manuscript Reviewer**, Communications Physics
2019-2020	**Manuscript Reviewer**, PLOS Computational Biology
2019	**Manuscript Reviewer**, Chaos AIP
2017	**Manuscript Subreviewer**, PLOS ONE

Departmental Service

2018	**Senior Grad Panel, Graduate School & Research**, Dept. of Physics, Northeastern University	*Boston, MA*
2017	**Panel member, Diversity and Inclusion Town Hall**, College of Science, Northeastern University	*Boston, MA*
2017	**Professional Development Workshop Organizer**, Dept. of Physics, Northeastern University	*Boston, MA*
2016-2018	**Graduate Student Union Dept. Leader**, Dept. of Physics, Northeastern University	*Boston, MA*
2014-2016	**Physics Graduate Student Representative**, Northeastern University	*Boston, MA*
2012	**Transit of Venus Outreach Science Volunteer**, Dept. of Astronomy & Astrophysics	*Toronto, Canada*
2011-2012	**Vice President of Academic Affairs**, Physics & Astronomy Student Union, University of Toronto	*Toronto, Canada*

Advanced Schools & Workshops

Vermont University — *Burlington, VT*

Invited participant to the Workshop on Invasion in Ecological Networks — *08/25/2019 - 08/31/2019*

Université Laval — *Quebec City, Canada*

Participant in the 1st Complex Networks Winter Workshop — *12/15/2018 - 12/22/2018*

University of Washington — *Seattle, WA*

Attended the 7th Annual Summer Institute in Statistics and Modeling in Infectious Diseases — *07/05/2015 - 07/22/2015*

Certificates obtained in the modules:

- Probability and Statistical Inference
- Stochastic Epidemic Models with Inference
- Simulation-based Inference for Epidemiological Dynamics
- MCMC I & II for Infectious Diseases

Awards & Honors

2015	**Summer Institute in Statistics and Modeling in Infectious Diseases Scholarship**, 7th Annual Summer Institute	*University of Washington*
2012-2014	**Graduate Teaching Assistantship Award**, Department of Physics	*Northeastern University*
2012	**Anna & Alex Beverly Memorial Fellowship**, for future graduate studies	*University of Toronto*
2012	**Marie Sklodowska-Curie Association Undergraduate Scholarship**, for academic excellence in Physics	*University of Toronto*
2011	**Undergraduate Summer Research Award**, Highly competitive research assistantship award. Conducted experiments to study the nonlinear growth of stalactites. *Advisor: Prof. Stephen Morris.*	*University of Toronto*
2008-2012	**Dean's List of Scholars**, Faculty of Arts & Science	*University of Toronto*
2008	**C. L. Burton Scholarship for Mathematics and Physics**, Faculty of Arts & Science	*University of Toronto*
2007	**Top Scholar's Scholarship**, Faculty of Arts & Science	*University of Toronto*
2007	**President's Entrance Scholarship**, Faculty of Arts & Science	*University of Toronto*

Teaching

2014	**Physics Lab Instructor**, U.S. Pathway Program (USPP), a summer bridge program for international students from China and Nigeria	*Northeastern University*
2012-2014	**Physics Lab Instructor**, Introductory Physics Labs (16 sections), Department of Physics	*Northeastern University*
2013-2014	**Physics Workshop Leader**, (6 sections) Department of Physics	*Northeastern University*
2012	**Interactive Learning Sessions Teaching Assistant**, Department of Physics	*Northeastern University*
2011	**AST201H1 Teaching Assistant**, Department of Astronomy & Astrophysics	*University of Toronto*

Media Coverage

'Covid Near You' Crowdsources Data to Predict New Hot Spots WIRED

Projecting the spread of Zika The Atlantic, New Scientist, Homeland Security News Wire, WBUR Boston NPR's News Station

PhD Profile: Canis lupus Graduate Student Newsletter, Northeastern University

Live Musical Performances

I have been playing the steel pan (native to the island nation of Trinidad and Tobago) since the age of 10, and performing publicly since the age of 14. From 14 through 18, I was a member of 3 performance bands, including 2 steel pan bands and a Jazz/Motown Ensemble. Most recently, I have joined the Seattle Steel Pan Project. My main instruments are the Double Tenor and Tenor Pans, though I am also known to play the Double Seconds, 6 Bass, Treble Bass, and Cello Pans.

Seattle Steel Pan Project

Redmond Library	*10/12/2019*	*Redmond, WA*
Seattle University	*09/22/2019*	*Seattle, WA*
Jackson Street Jazz Walk	*09/07/2019*	*Seattle, WA*
University Heights	*09/07/2019*	*Seattle, WA*
CID Summer Cinema Hing Hay Park	*08/24/2019*	*Seattle, WA*
Belltown Crush	*08/24/2019*	*Seattle, WA*
Sullivan Center Tukwila	*08/21/2019*	*Tukwila, WA*
Normandy Park Music in the Park	*08/11/2019*	*Normandy, WA*
Othello Park International Festival	*08/11/2019*	*Othello, WA*
Seattle Caribbean Festival	*07/28/2019*	*Seattle, WA*
Dance and Splash	*07/13/2019*	*Seattle, WA*
Nordstrom's Downtown Seattle	*07/12/2019*	*Seattle, WA*
Fremont Solstice Parade	*06/22/2019*	*Fremont, WA*
Renton Technical College Commencement	*06/20/2019*	*Renton, WA*
Highline College	*05/23/2019*	*Des Moines, WA*
Tulalip Casino and Resort	*04/13/2019*	*Tulalip, WA*
Powered By Women, Langston Hughes	*03/30/2019*	*Seattle, WA*